

# **UPDATE**

## **Rapid Inquiry Facility (RIF)**

### **in Utah**



**North American Association of  
Central Cancer Registries  
Regina, Canada  
May 2006**

**National Environmental  
Public Health Conference  
Atlanta GA  
Dec 2006**



**Council of State and  
Territorial Epidemiologists  
Anaheim CA  
June 2006**

**Spatial Statistical  
Conference  
London UK  
May 2006**



**Utania**

**Callarada**

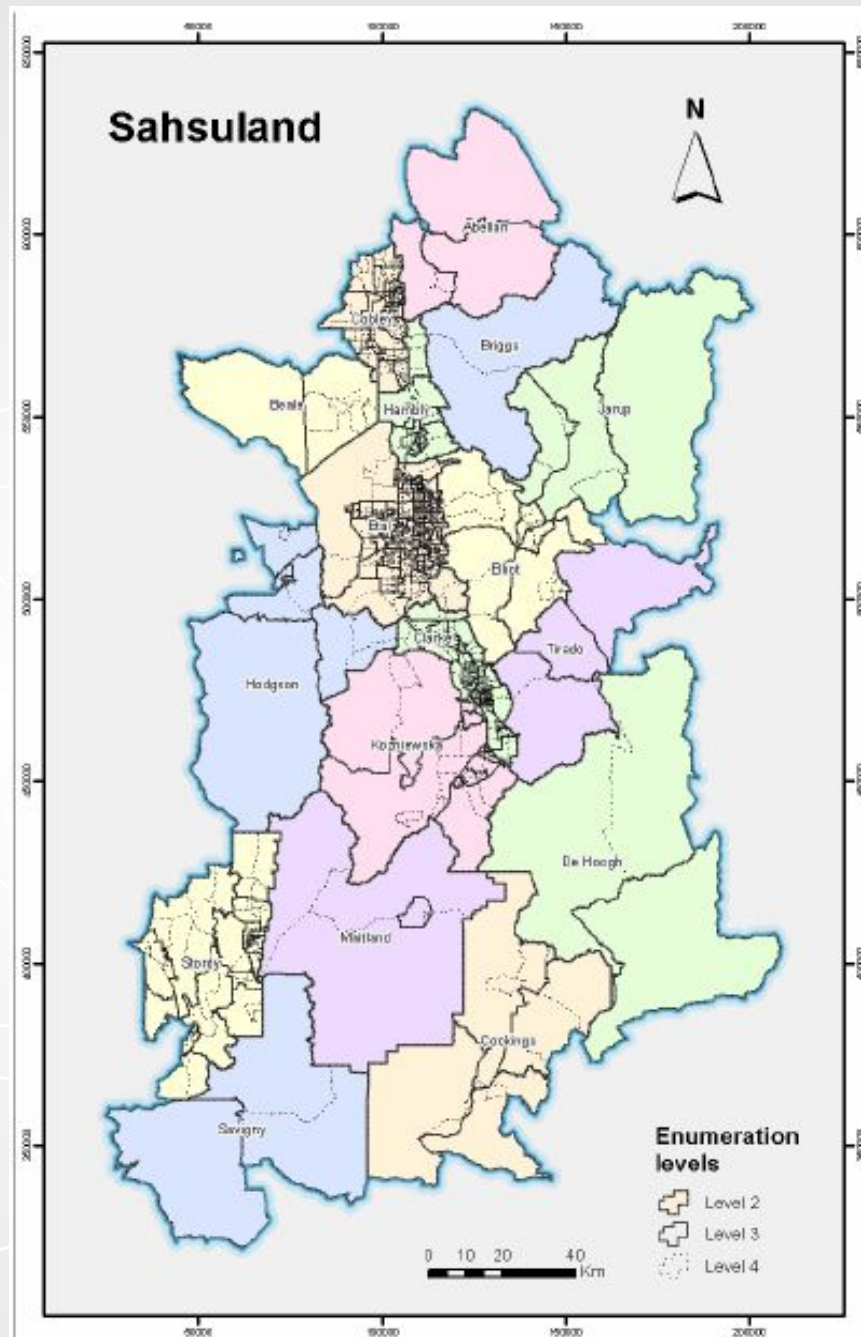
***Rifania***

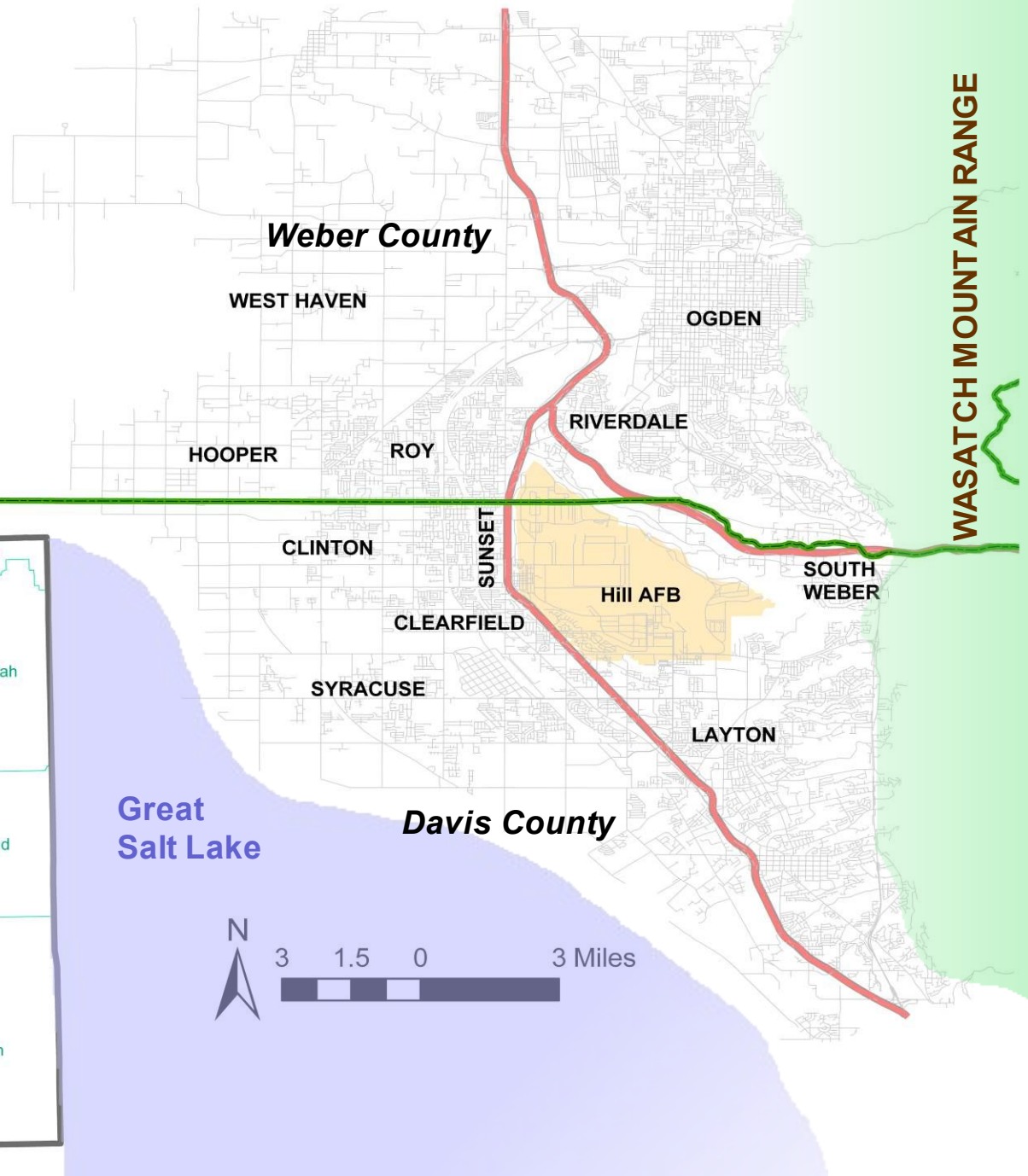
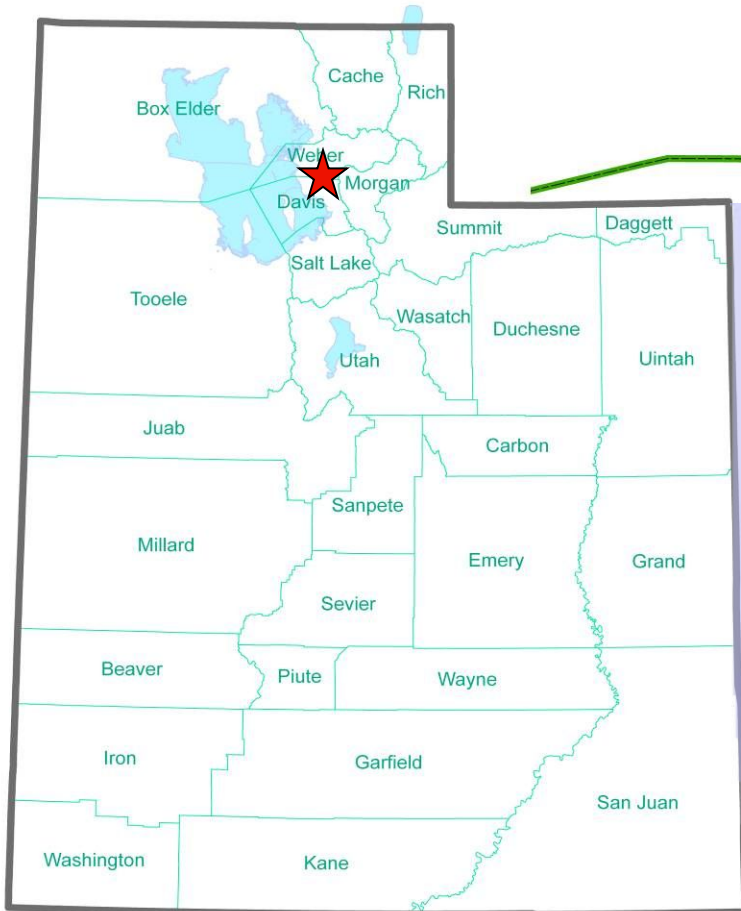
**Arizana**

**Newmex**



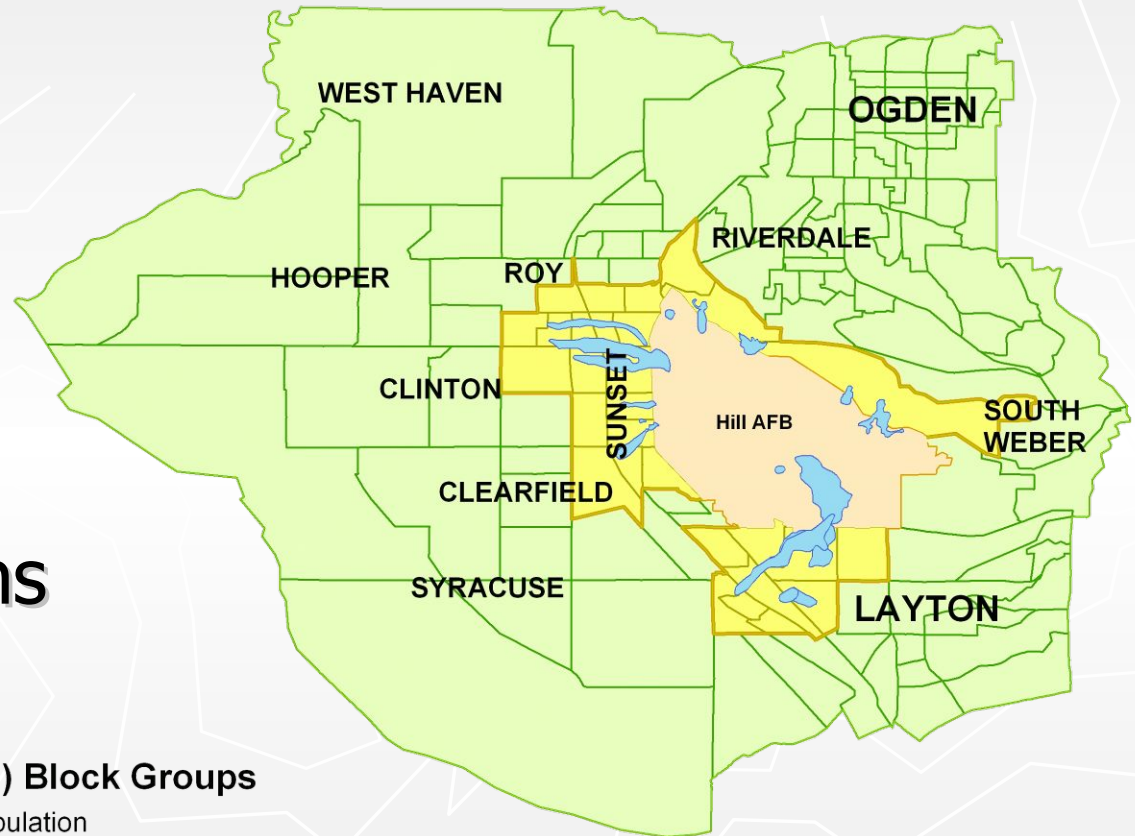






# The Study Area

- ▶ 11 Zip Codes
- ▶ 143 Census Block Groups
- ▶ 247,000 Persons



## Census (2000) Block Groups

- Exposed Population
- Unexposed Population
- Contaminated Ground Water Plumes



# Methods

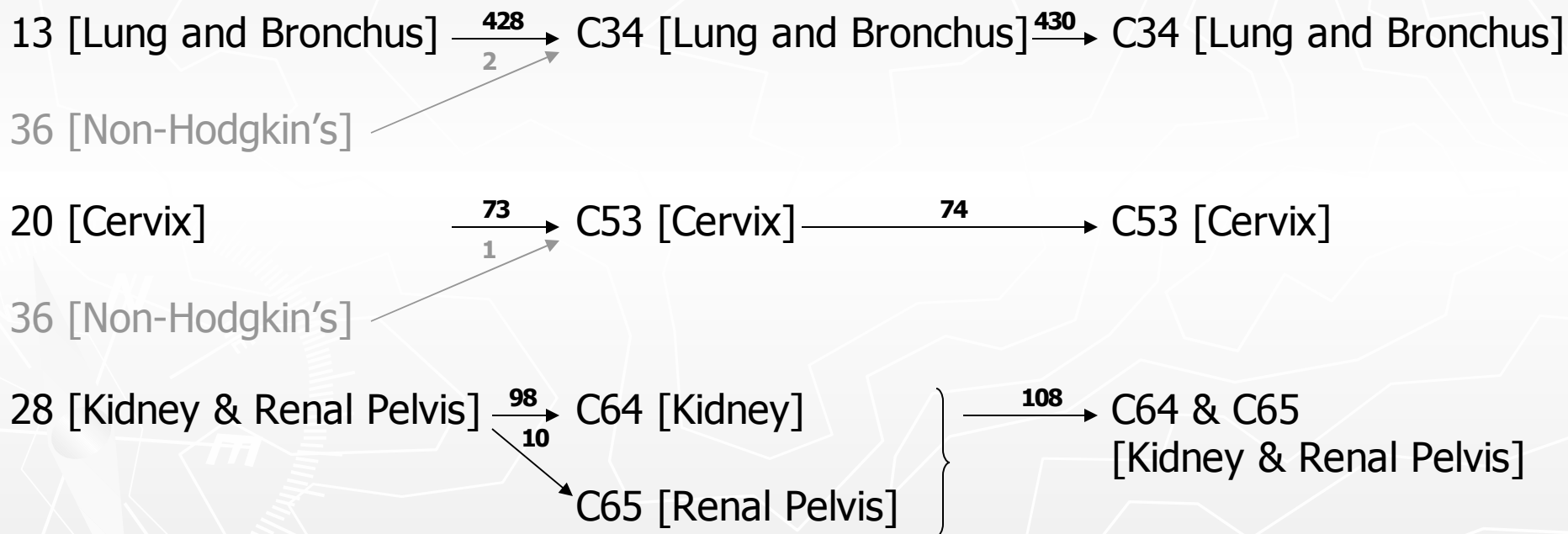
	<b>TRADITIONAL METHOD</b>	<b>RAPID INQUIRY FACILITY</b>
<b><i>Disease Categorization</i></b>	Utah Cancer Registry (SEER) Site Code (1...42)	ICD-10 Disease Codes (derived from ICDO-3 Site Codes)
<b><i>Exposed Population</i></b>	32 Census Block Groups adjacent to and including Hill AFB	32 Census Block Groups adjacent to and including Hill AFB
<b><i>Comparison Population</i></b>	111 Census Block Groups surrounding the exposed population	111 Census Block Groups surrounding the exposed population
<b><i>Statistic</i></b>	Standardized Incidence Ratio (95% Confidence Interval)	Relative Risk (95% Confidence Interval)
<b><i>Adjustments</i></b>	Sex 5-year Age Groups	Sex 5-year Age Groups
	Residential Tenure Familial History	Median Personal Income (Socio-Deprivation Index)
<b><i>Analysis</i></b>	5-Year Statistics (1990-1994 ... 1996-2000)	5-Year Statistics (1990-1994 ... 1996-2000)

# Definition of Cancer Type

## Utah Cancer Registry (SEER) Site Code

## ICDO-3

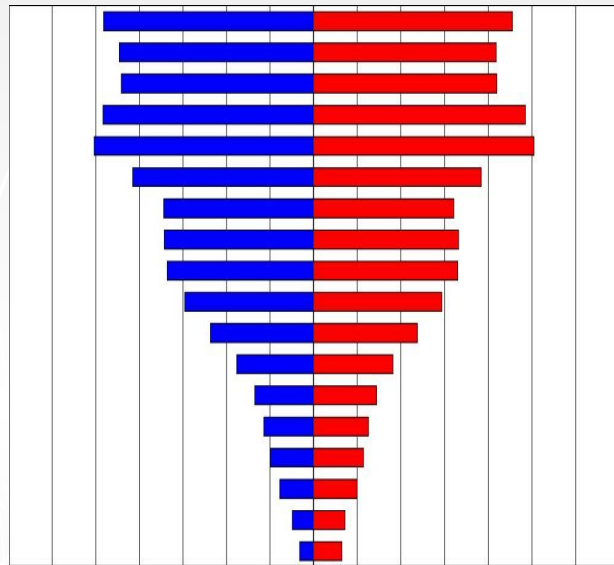
## ICD-10



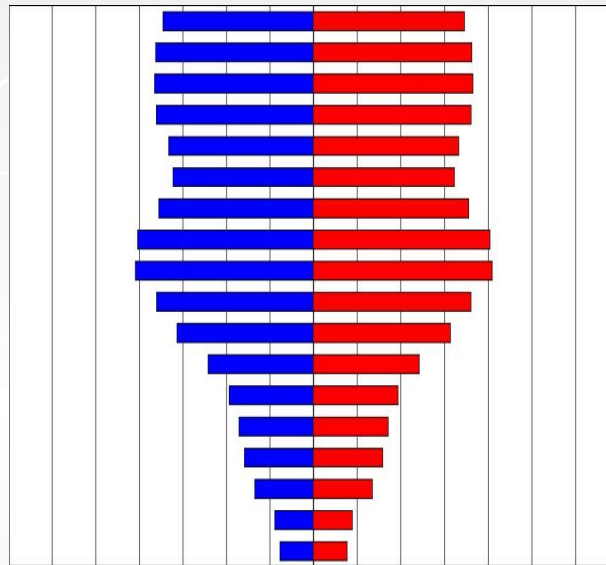
Number of Cases in the Study Area (Exposed and Unexposed Populations) from 1990 through 2000



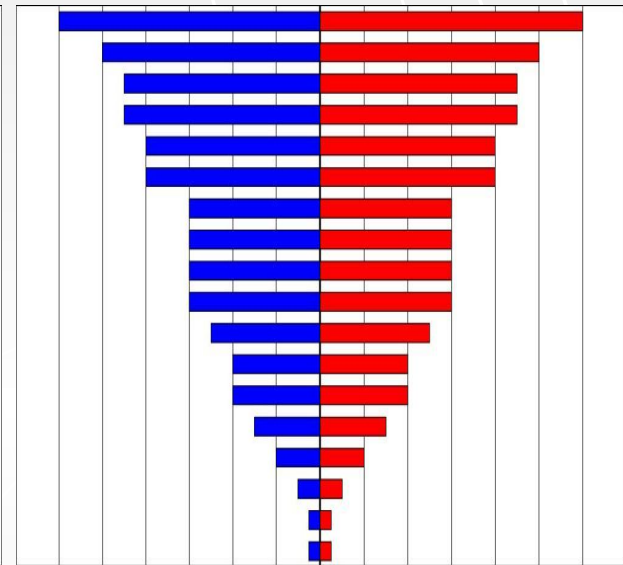
# Standard Population



**Utah 2000**



**US Std 2000**

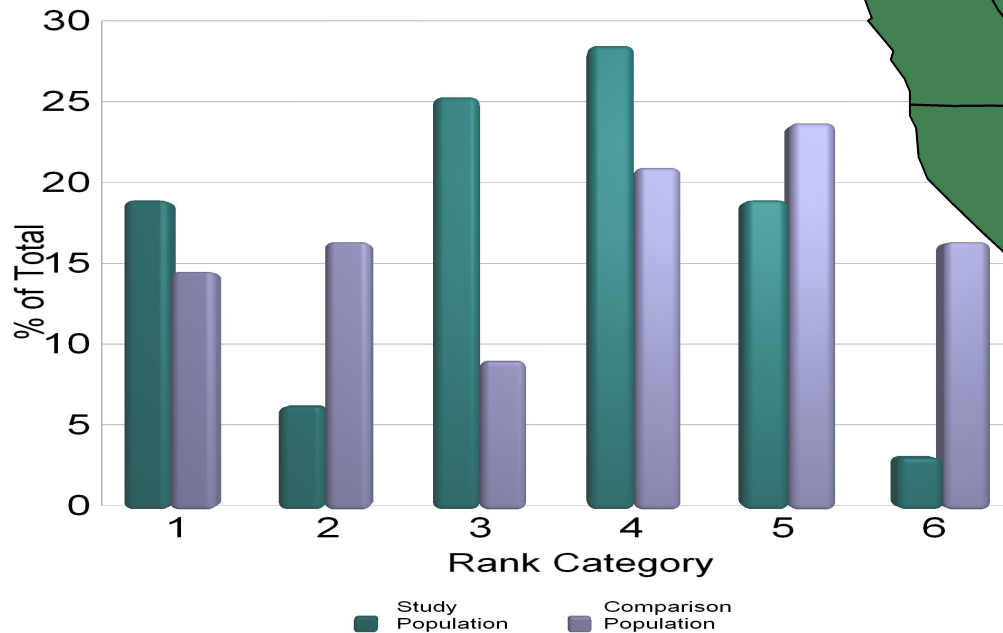
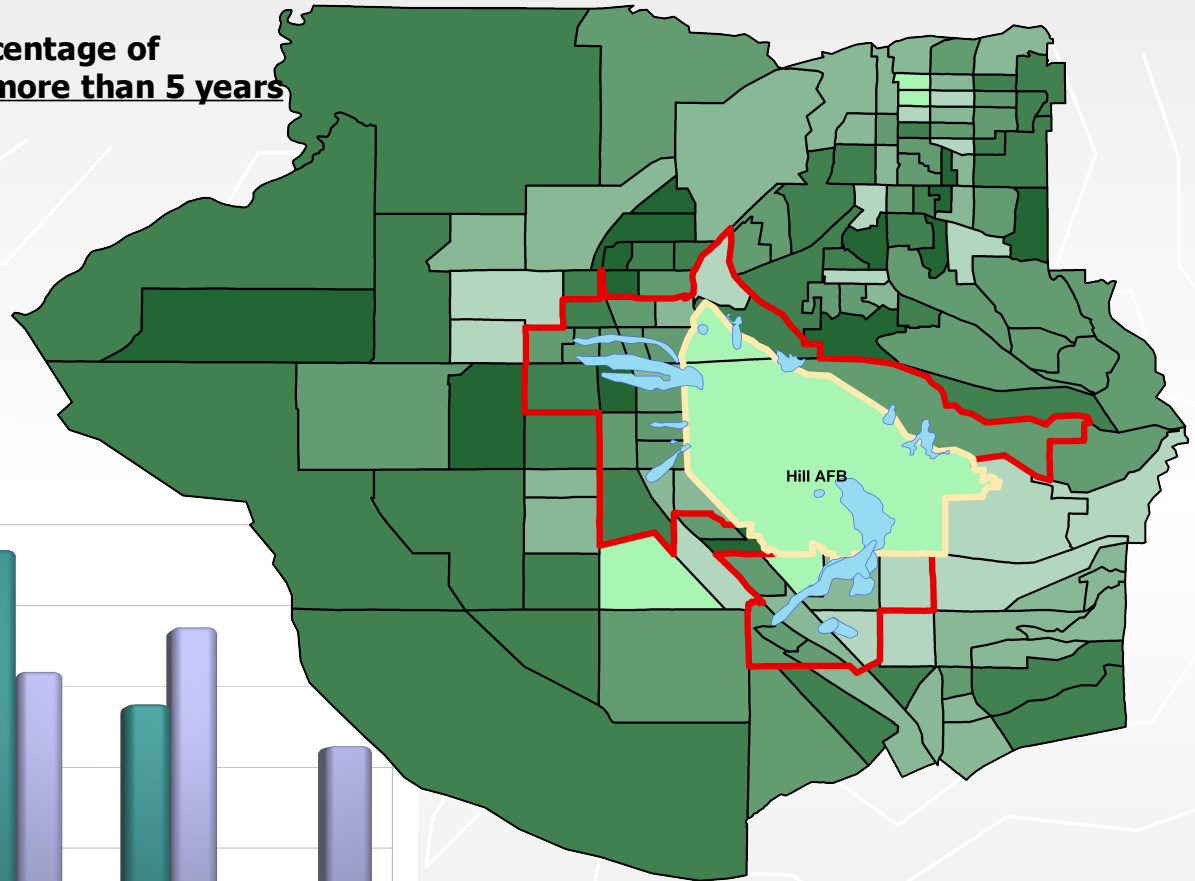


**World Std 1991**

# Residential Tenure

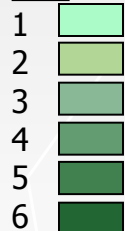
## SDI

- | SDI | Deviation from Mean Percentage of Population at Residence more than 5 years |
|-----|---|
| 1   | < 1.0 STD Below Mean  |
| 2   | 1.0 – 0.5 STD Below Mean  |
| 3   | 0.5 – Mean  |
| 4   | Mean – 0.5 STD Above Mean   |
| 5   | 0.5 – 1.0 STD Above Mean  |
| 6   | > 1.0 STD Above Mean  |



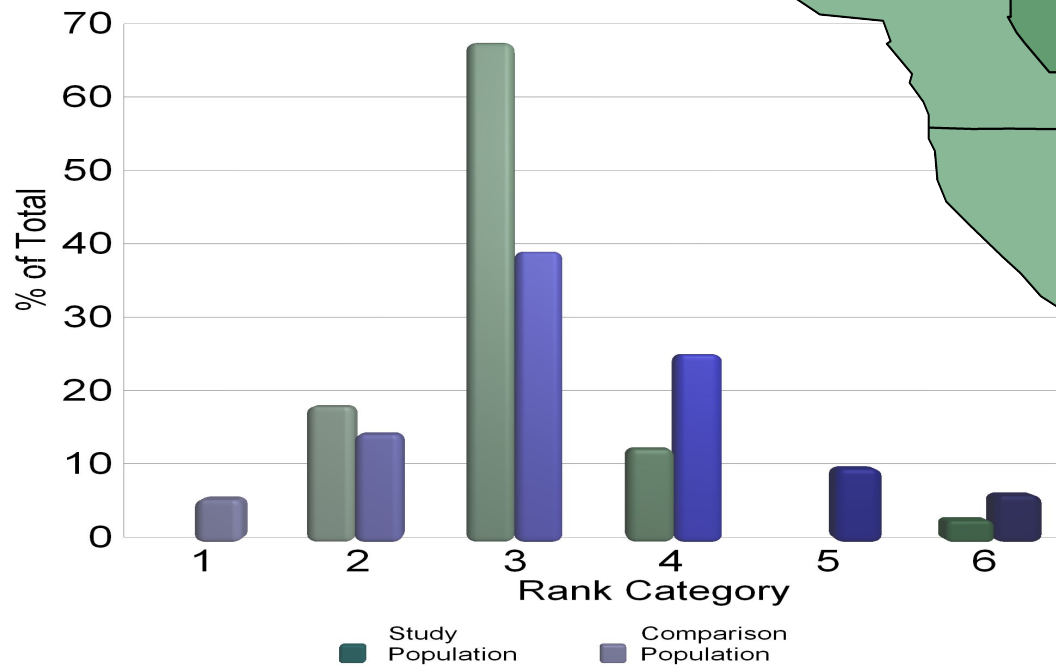
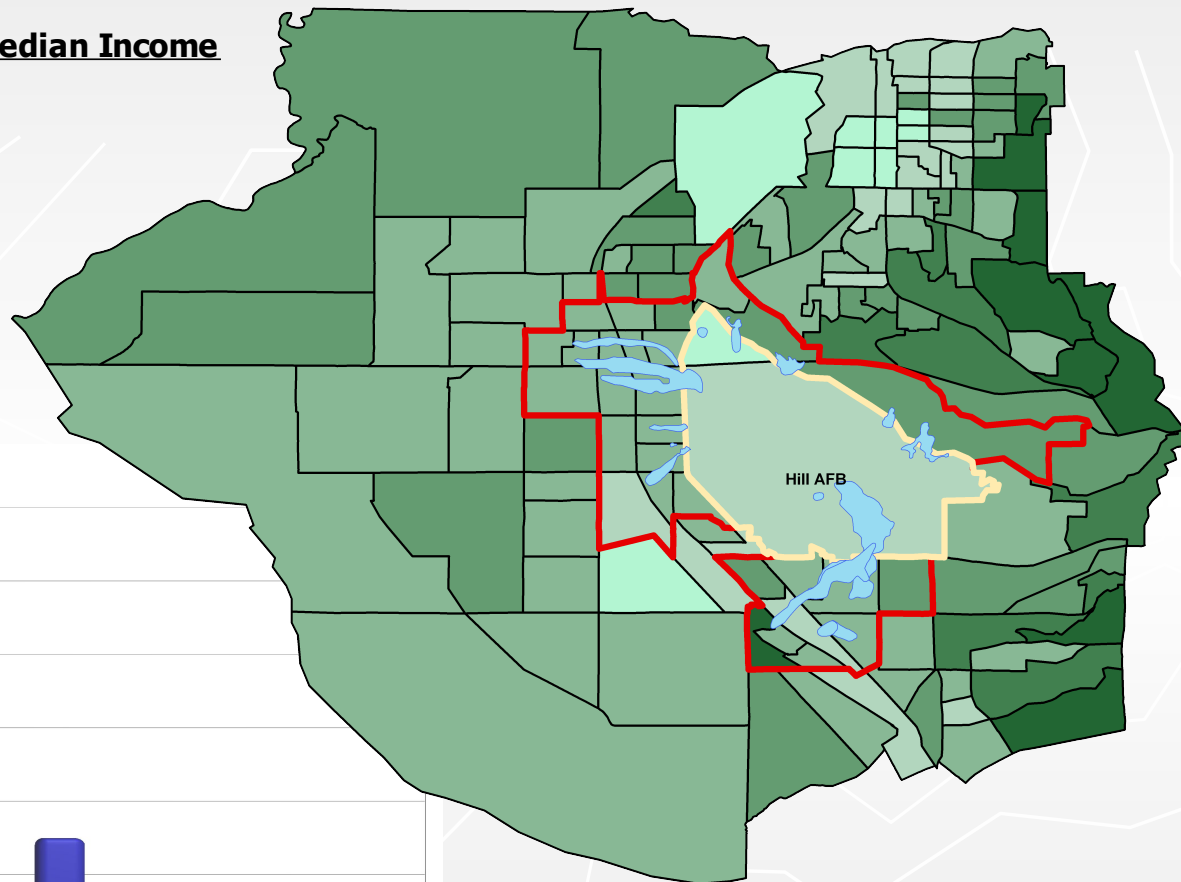
# Median Income

## **SDI**



## **Deviation from Mean of Median Income**

< 1.0 STD Below Mean  
 1.0 – 0.5 STD Below Mean  
 0.5 – Mean  
 Mean – 0.5 STD Above Mean  
 0.5 – 1.0 STD Above Mean  
 > 1.0 STD Above Mean





# Lung and Bronchus

Period	STANDARDIZED INCIDENCE RATIO							RAPID INQUIRY FACILITY (RELATIVE RISK)						
	Observed	Adjusted for Age and Sex			Adjusted for Age, Sex, Residential Tenure and Family History			Observed	Adjusted for Age and Sex			Adjusted for Age, Sex and SDI		
		SIR	LCL	UCL	SIR	LCL	UCL		RR	LCL	UCL	RR	LCL	UCL
<b>1990-1994</b>	41	1.01	0.72	1.36	0.96	0.64	1.23	38	0.98	0.69	1.34	0.99	0.70	1.36
<b>1991-1995</b>	46	1.16	0.85	1.55	1.11	0.76	1.40	43	1.12	0.81	1.51	1.17	0.84	1.57
<b>1992-1996</b>	53	1.42	1.06	1.85	1.36	0.96	1.69	50	1.37	1.02	1.80	1.52	1.13	2.01
<b>1993-1997</b>	57	1.45	1.10	1.88	1.40	1.00	1.73	54	1.40	1.05	1.83	1.58	1.19	2.06
<b>1994-1998</b>	60	1.58	1.21	2.03	1.53	1.11	1.89	58	1.53	1.16	1.98	1.59	1.21	2.05
<b>1995-1999</b>	57	1.44	1.09	1.87	1.40	1.01	1.74	57	1.43	1.09	1.86	1.45	1.10	1.88
<b>1996-2000</b>	56	1.16	0.87	1.50	1.25	0.90	1.56	56	1.27	0.96	1.64	1.22	0.92	1.58

Observed is the number of cases in the potentially exposed population

SIR = Standardized Incidence Ratio

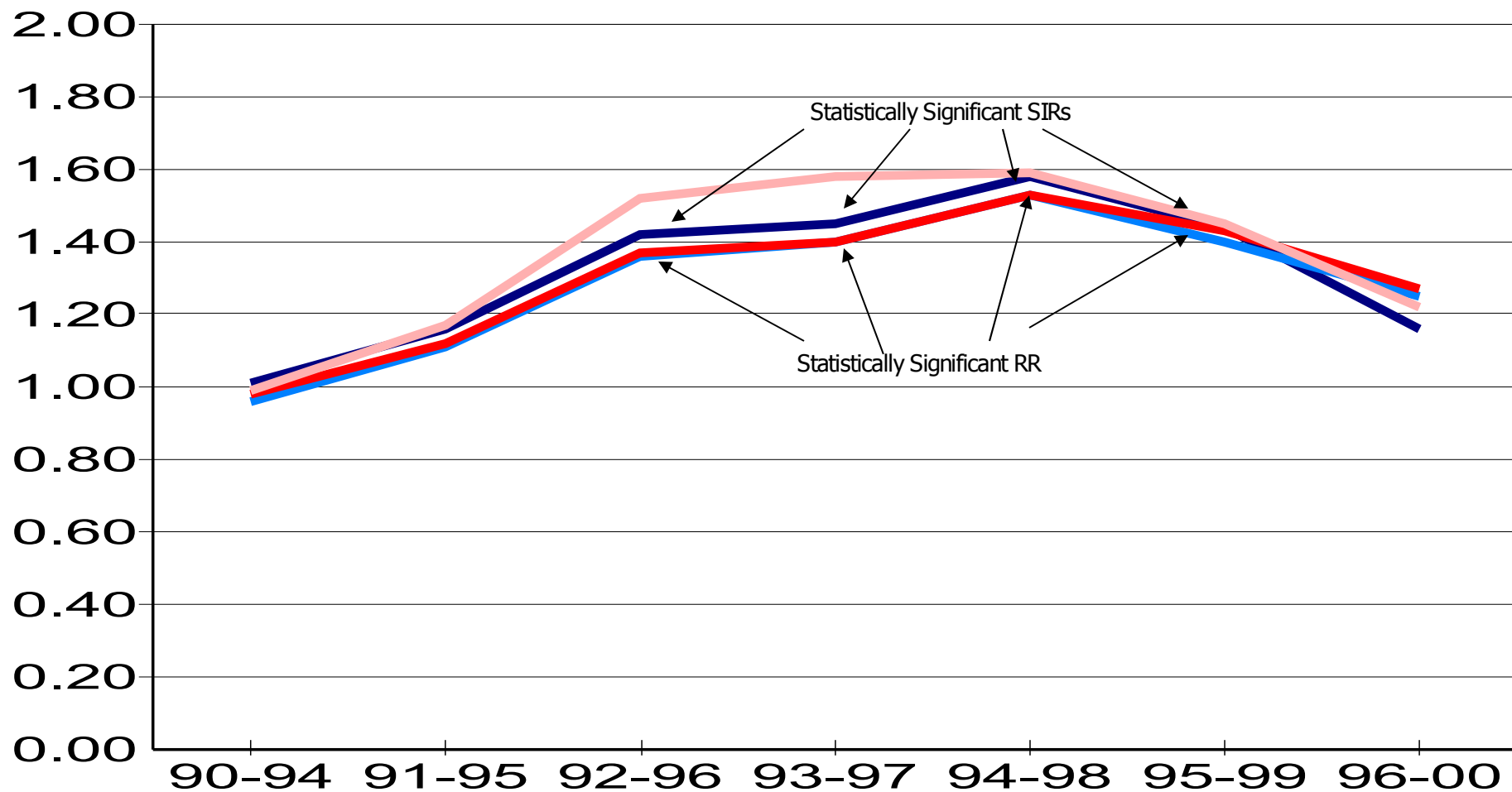
RR = Relative Risk

LCL = 95% Lower Confidence Limit

UCL = 95% Upper Confidence Limit

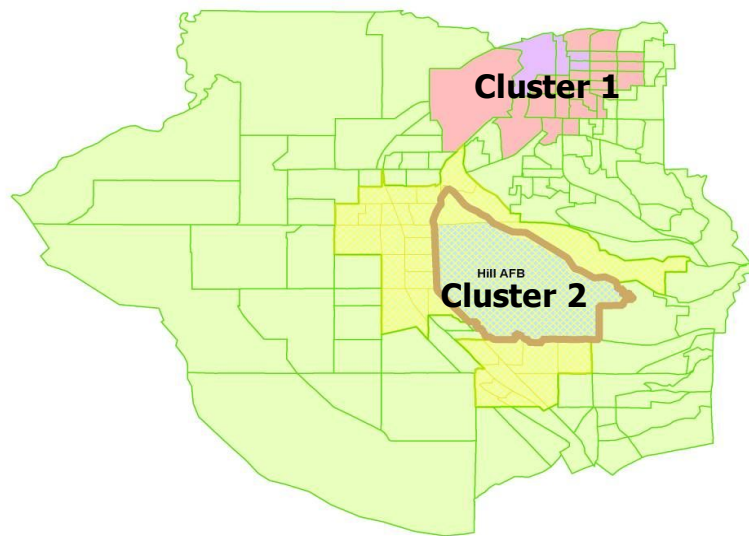
SDI = Socio-Economic Deprivation Index (ranked Median Income)

# Lung and Bronchus



— SIR  
— SIR (FH & RT)

— RIF RR  
— RIF RR w SDI



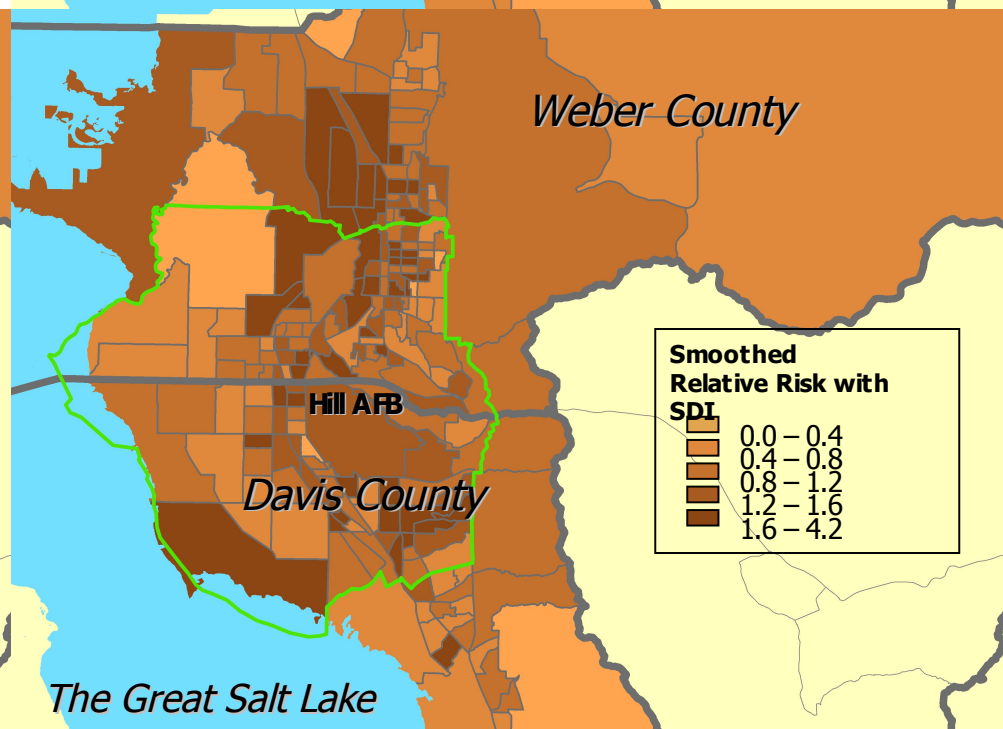
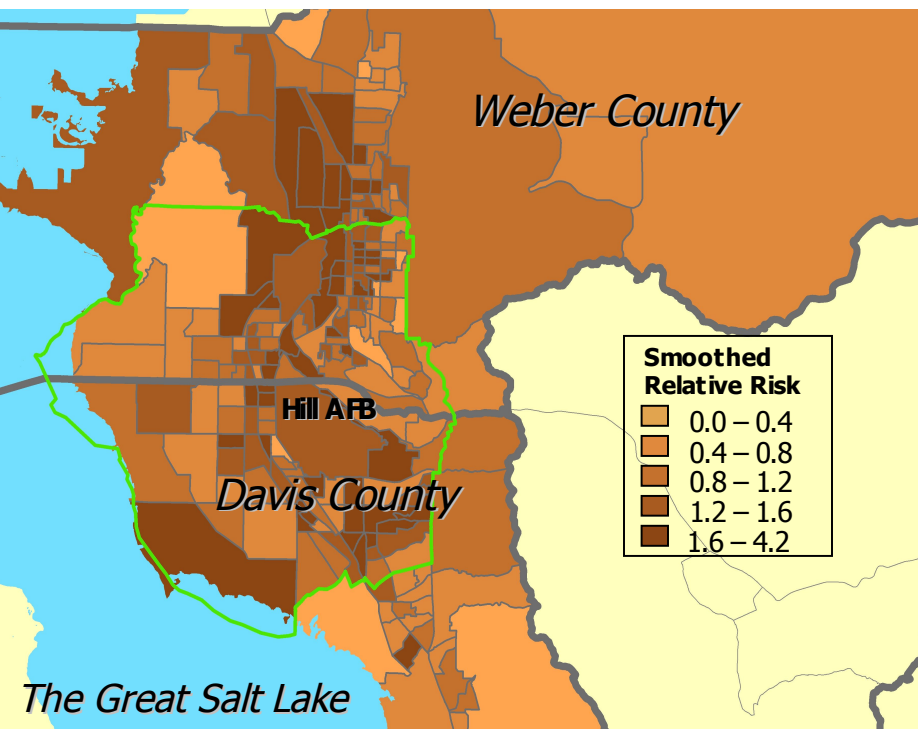
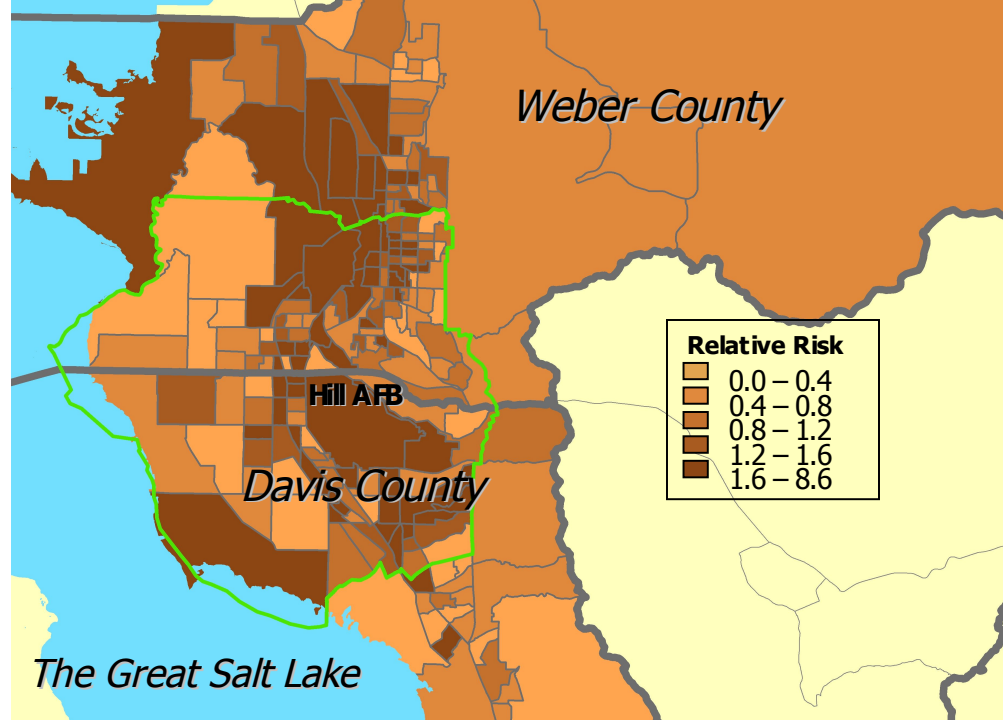
**Census (2000) Block Group Boundaries**

- Unexposed Population
- Exposed Population

**SaTScan Results for Lung Cancers**

Significant when Stratified by:

- Age & Sex
- Age, Sex, Residential Tenure & Familial History
- Age & Sex or Age, Sex, Residential Tenure & Familial History



# Cervix

Period	STANDARDIZED INCIDENCE RATIO							RAPID INQUIRY FACILITY (RELATIVE RISK)						
	Observed	Adjusted for Age and Sex			Adjusted for Age, Sex, Residential Tenure and Family History			Observed	Adjusted for Age and Sex			Adjusted for Age, Sex and SDI		
		SIR	LCL	UCL	SIR	LCL	UCL		RR	LCL	UCL	RR	LCL	UCL
<b>1990-1994</b>	6	0.70	0.25	1.51	0.65	0.12	1.02	6	0.71	0.26	1.54	0.80	0.29	1.74
<b>1991-1995</b>	7	0.85	0.34	1.75	0.80	0.18	1.24	7	0.87	0.35	1.79	0.93	0.37	1.92
<b>1992-1996</b>	7	0.77	0.31	1.58	0.72	0.16	1.12	7	0.75	0.30	1.54	0.77	0.31	1.59
<b>1993-1997</b>	6	0.69	0.25	1.50	0.65	0.12	1.02	6	0.67	0.24	1.45	0.61	0.22	1.32
<b>1994-1998</b>	6	0.68	0.25	1.49	0.64	0.12	1.01	6	0.68	0.25	1.48	0.59	0.22	1.29
<b>1995-1999</b>	7	1.01	0.41	2.08	0.95	0.22	1.47	7	0.97	0.39	2.01	0.71	0.28	1.45
<b>1996-2000</b>	7	0.86	0.34	1.77	0.93	0.21	1.44	8	1.10	0.47	2.16	0.91	0.39	1.79

Observed is the number of cases in the potentially exposed population

SIR = Standardized Incidence Ratio

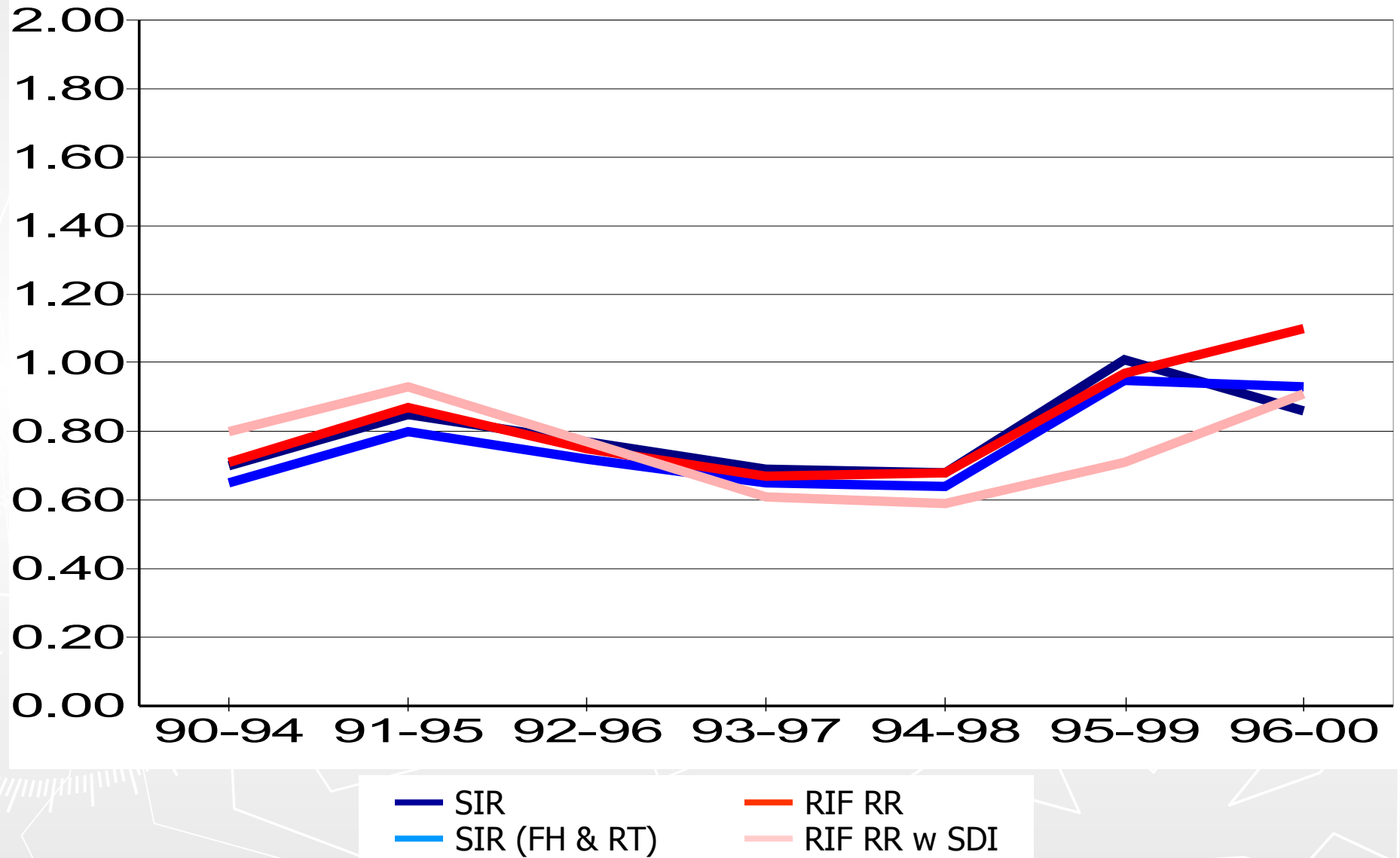
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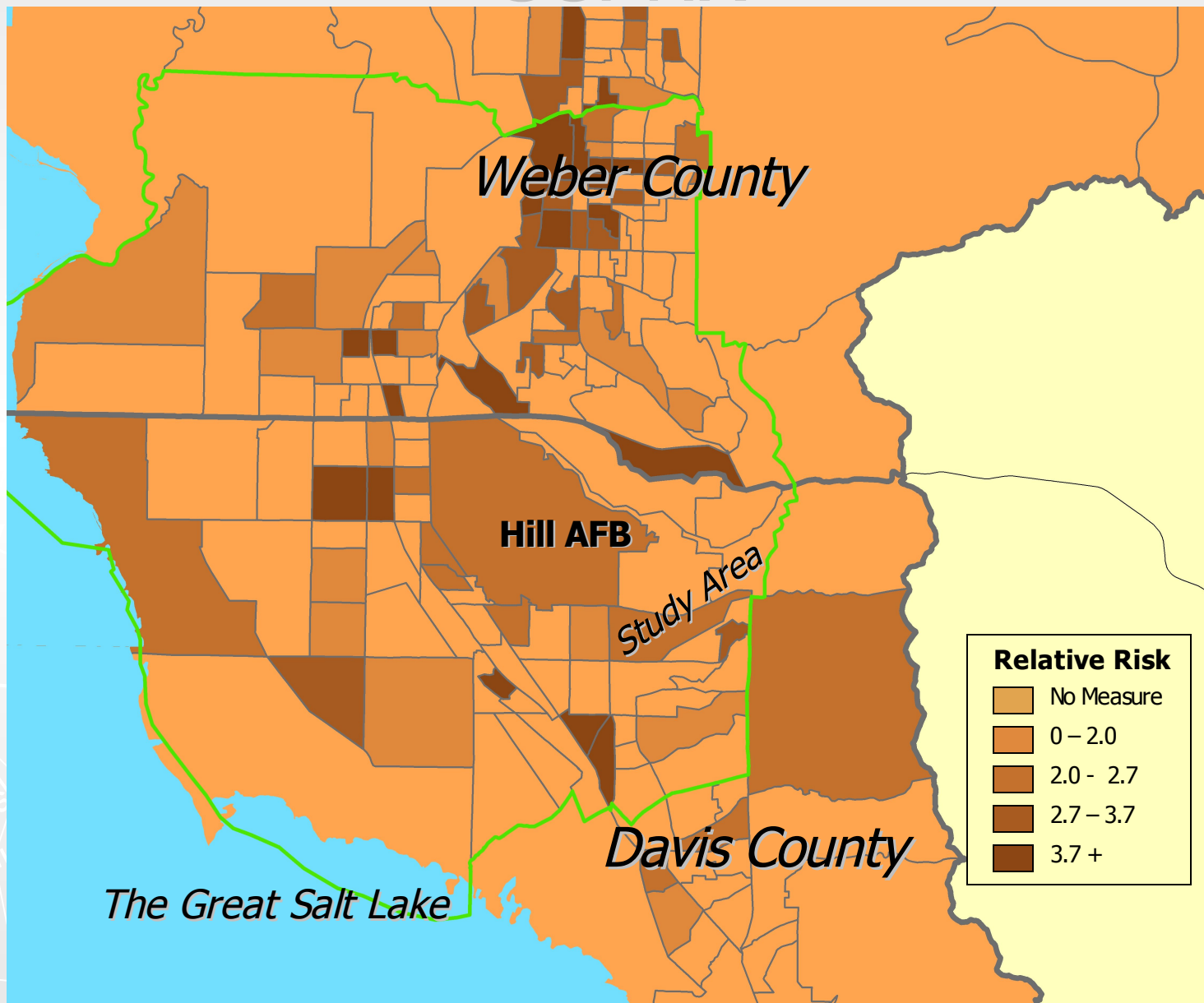
UCL = 95% Upper Confidence Limit

SDI = Socio-Economic Deprivation Index (ranked Median Income)

# Cervix



# Cervix



# Kidney and Renal Pelvis

Period	STANDARDIZED INCIDENCE RATIO							RAPID INQUIRY FACILITY (RELATIVE RISK)						
	Observed	Adjusted for Age and Sex			Adjusted for Age, Sex, Residential Tenure and Family History			Observed	Adjusted for Age and Sex			Adjusted for Age, Sex and SDI		
		SIR	LCL	UCL	SIR	LCL	UCL		RR	LCL	UCL	RR	LCL	UCL
<b>1990-1994</b>	11	1.56	0.78	2.80	1.51	0.54	2.22	12	1.87	0.97	3.26	2.65	1.37	4.63
<b>1991-1995</b>	9	1.16	0.53	2.20	1.13	0.34	1.70	9	1.09	0.47	2.14	1.50	0.65	2.96
<b>1992-1996</b>	9	0.95	0.44	1.81	0.93	0.28	1.39	9	0.88	0.38	1.73	1.33	0.57	2.62
<b>1993-1997</b>	7	0.65	0.26	1.33	0.63	0.14	0.97	7	0.58	0.22	1.26	0.72	0.26	1.56
<b>1994-1998</b>	9	0.87	0.40	1.65	0.85	0.26	1.28	9	0.79	0.34	1.55	0.91	0.39	1.78
<b>1995-1999</b>	13	1.18	0.63	2.02	1.15	0.47	1.67	13	1.11	0.57	1.93	1.16	0.60	2.03
<b>1996-2000</b>	10	0.72	0.35	1.33	0.84	0.28	1.25	10	0.88	0.42	1.61	0.98	0.47	1.80

Observed is the number of cases in the potentially exposed population

SIR = Standardized Incidence Ratio

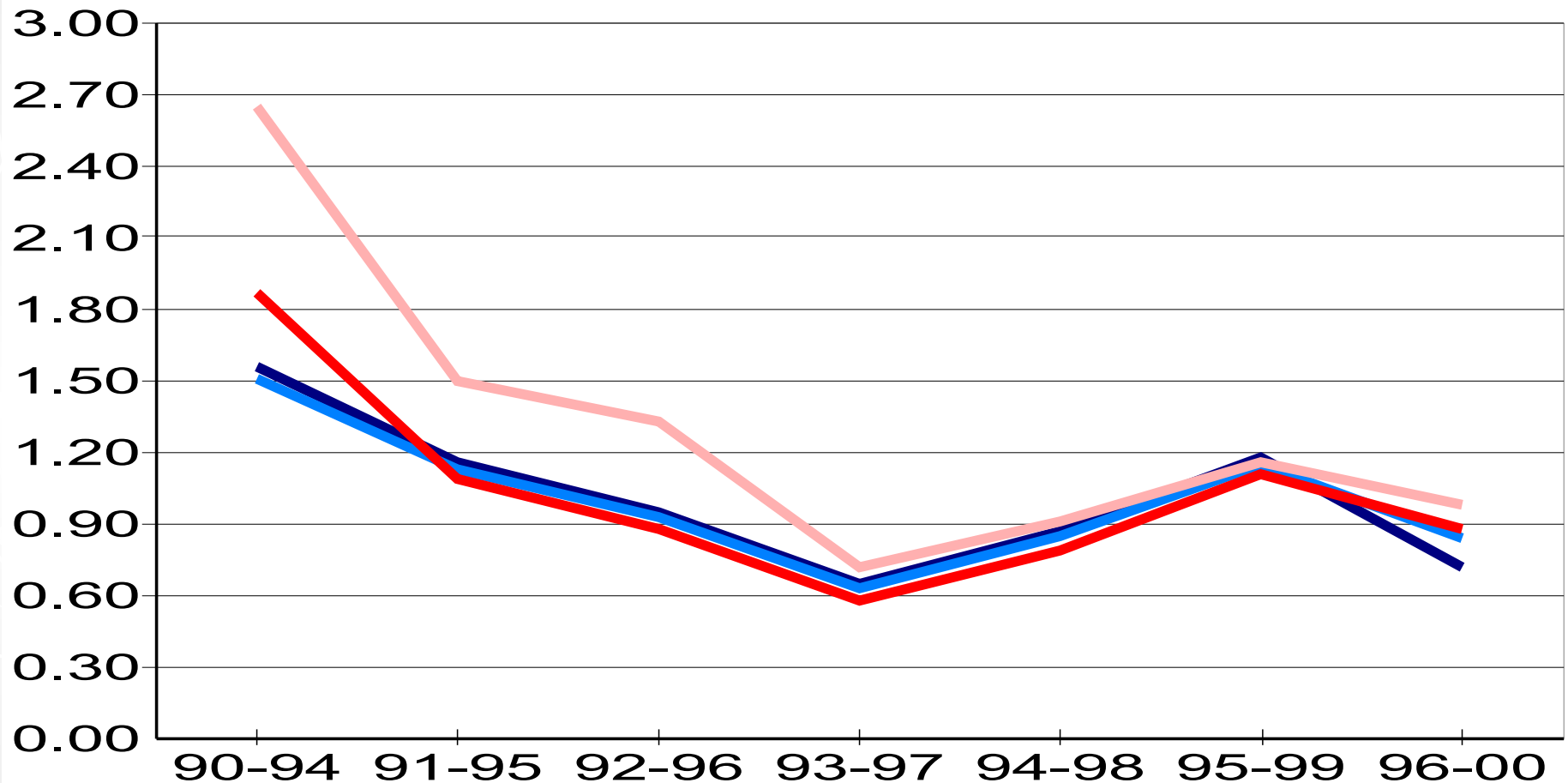
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# Kidney and Renal Pelvis

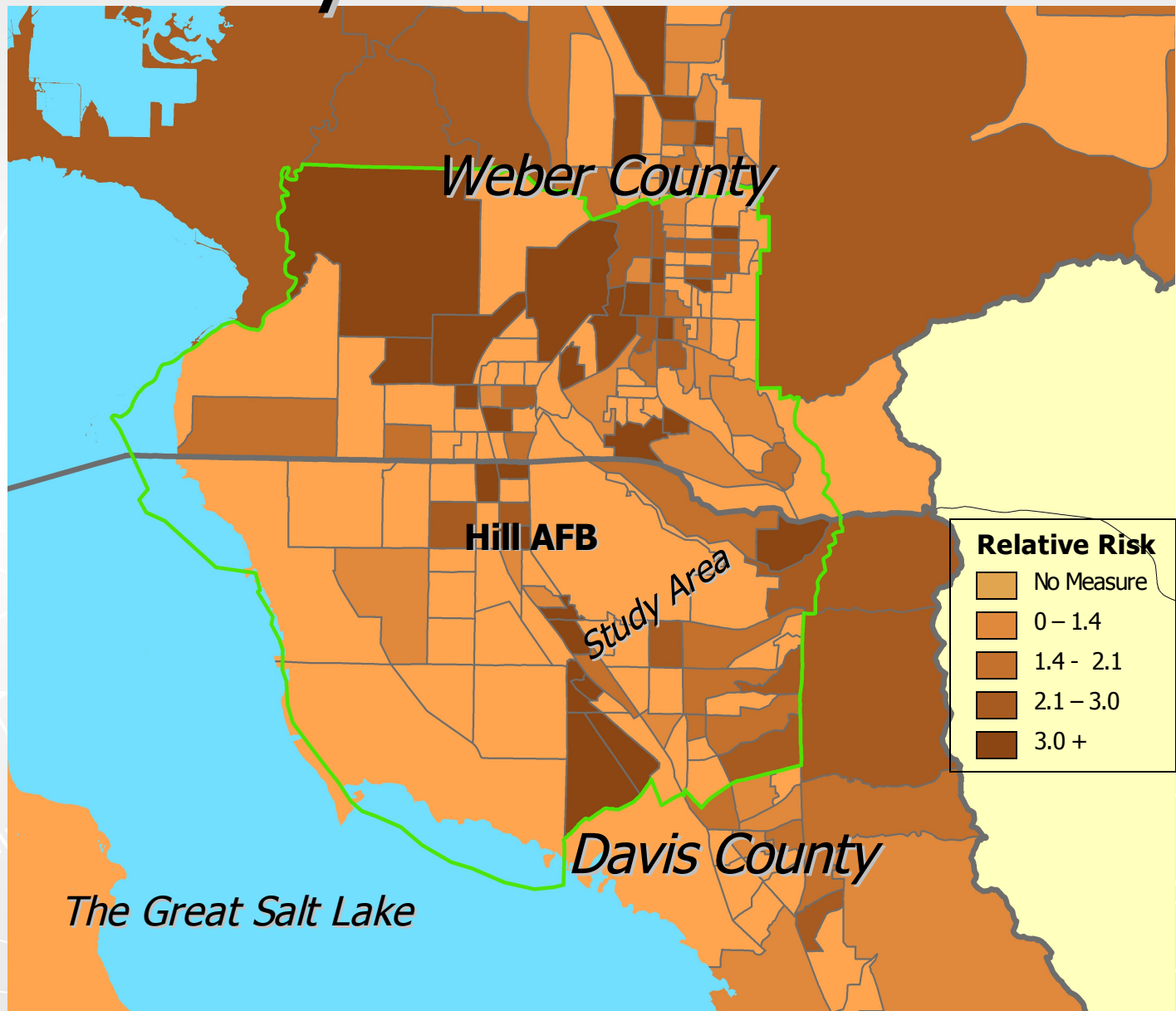


— SIR  
— SIR (FH & RT)

— RIF RR  
— RIF RR w SDI

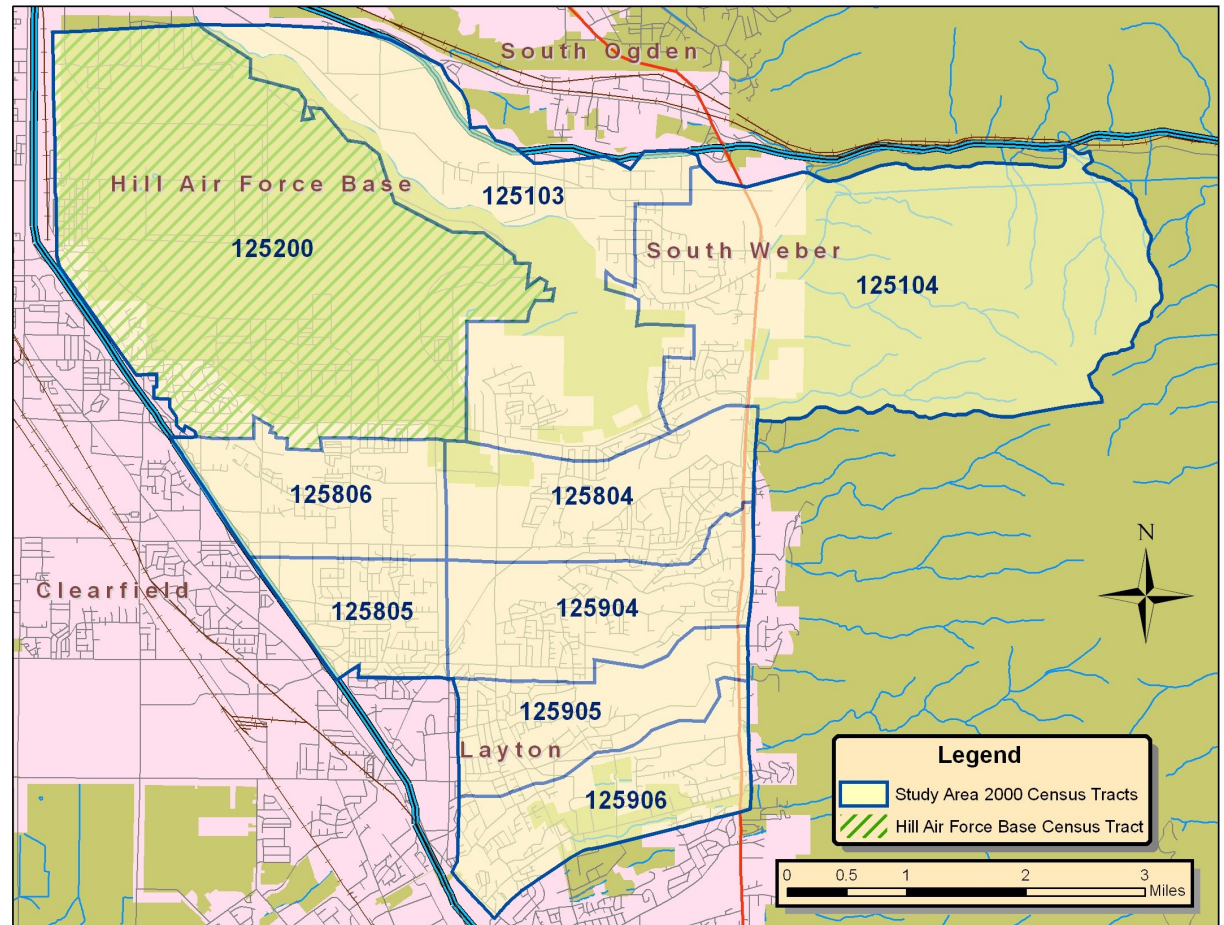


# Kidney and Renal Pelvis



# Layton Brain Cancer Study

- ▶ Citizens' concerns regarding a perceived increase in brain cancer associated with an incinerator starting in 1988.
- ▶ A 2002 study found no increased risk but recommended continued study.
- ▶ Chemical of concern is dioxin.
- ▶ Study Area: City of Layton (8 Census Tracts) and Hill AFB (1 Census Tract)
- ▶ Comparison population: State of Utah



# Methods

	<b>TRADITIONAL METHOD</b>	<b>RAPID INQUIRY FACILITY</b>
<b><i>Disease Categorization</i></b>	Utah Cancer Registry (SEER) Site Code (1...42)	ICD-10 Disease Codes (derived from ICDO-3 Site Codes)
<b><i>Exposed Population</i></b>	9 Utah 2000 Census Tracts for City of Layton and Hill AFB	9 Utah 2000 Census Tracts for City of Layton and Hill AFB
<b><i>Comparison Population</i></b>	State of Utah	State of Utah
<b><i>Statistic</i></b>	Standardized Incidence Ratio (95% Confidence Interval)	Relative Risk (95% Confidence Interval)
<b><i>Adjustments</i></b>	Sex 5-year Age Groups	Sex 5-year Age Groups
		Median Personal Income (Socio-Deprivation Index)
<b><i>Analysis</i></b>	5-Year Statistics (1990-1994 ... 1996-2000)	5-Year Statistics (1990-1994 ... 1996-2000)

# Brain

Period	STANDARDIZED INCIDENCE RATIO				RAPID INQUIRY FACILITY (RELATIVE RISK)						
	Observed	Adjusted for Age and Sex			Observed	Adjusted for Age and Sex			Adjusted for Age, Sex and SDI		
		SIR	LCL	UCL		RR	LCL	UCL	RR	LCL	UCL
<b>1990-1994</b>	10	1.23	0.59	2.27	10	1.23	0.59	2.27	1.19	0.57	2.19
<b>1991-1995</b>	10	1.17	0.56	2.16	10	1.18	0.57	2.17	1.12	0.54	2.05
<b>1992-1996</b>	7	0.79	0.32	1.64	7	0.81	0.33	1.67	0.76	0.30	1.56
<b>1993-1997</b>	14	1.54	0.84	2.85	14	1.53	0.84	2.57	1.48	0.81	2.48
<b>1994-1998</b>	18	1.89	1.12	2.98	18	1.86	1.10	2.94	1.79	1.06	2.82
<b>1995-1999</b>	21	2.12	1.31	3.24	21	2.08	1.29	3.18	1.99	1.23	3.05
<b>1996-2000</b>	23	2.32	1.47	3.48	23	2.29	1.45	3.44	2.23	1.42	3.35

Observed is the number of cases in the potentially exposed population

SIR = Standardized Incidence Ratio

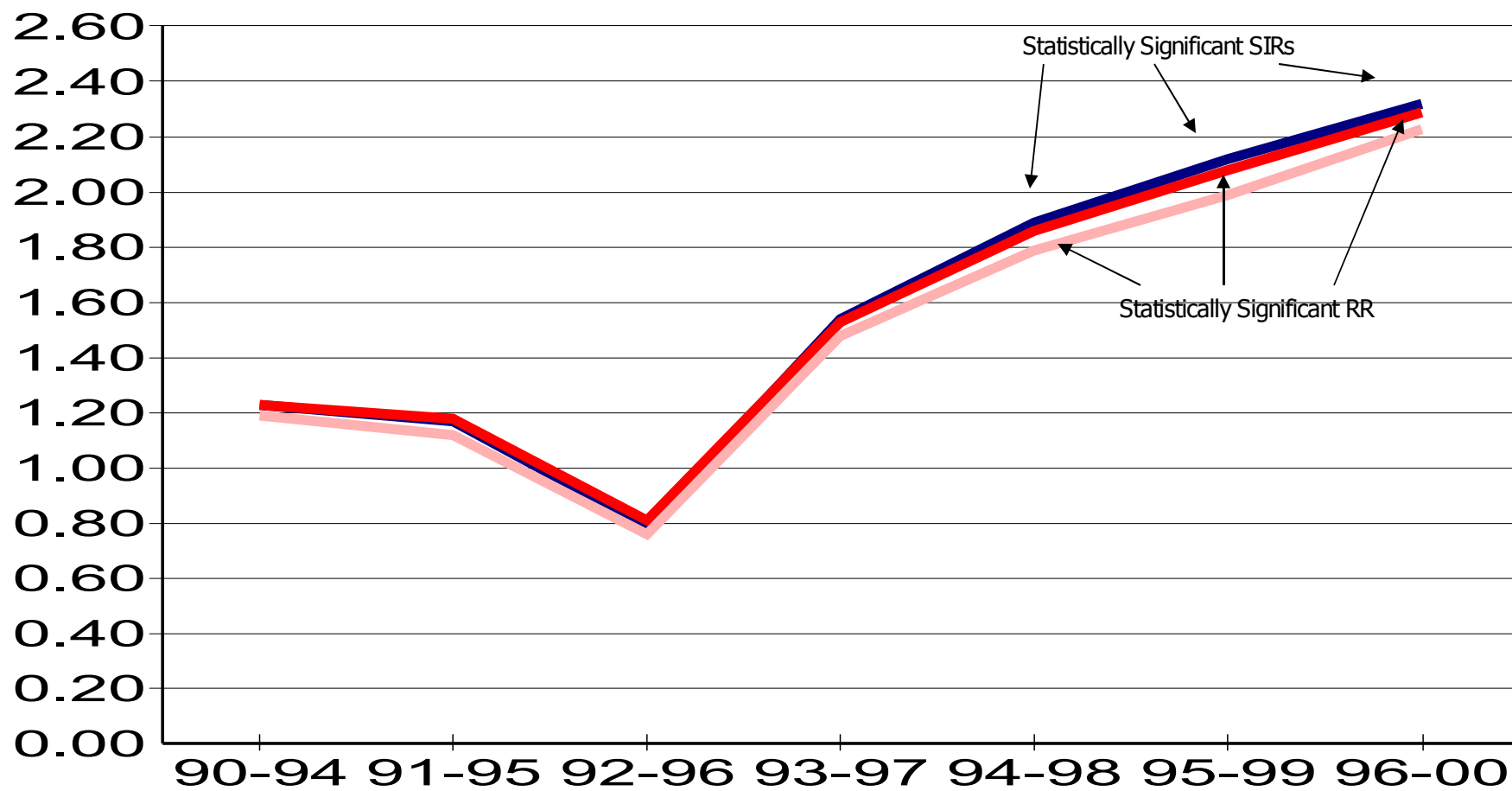
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LCL = 95% Lower Confidence Limit

UCL = 95% Upper Confidence Limit

SDI = Socio-Economic Deprivation Index (ranked Median Income)

# Brain

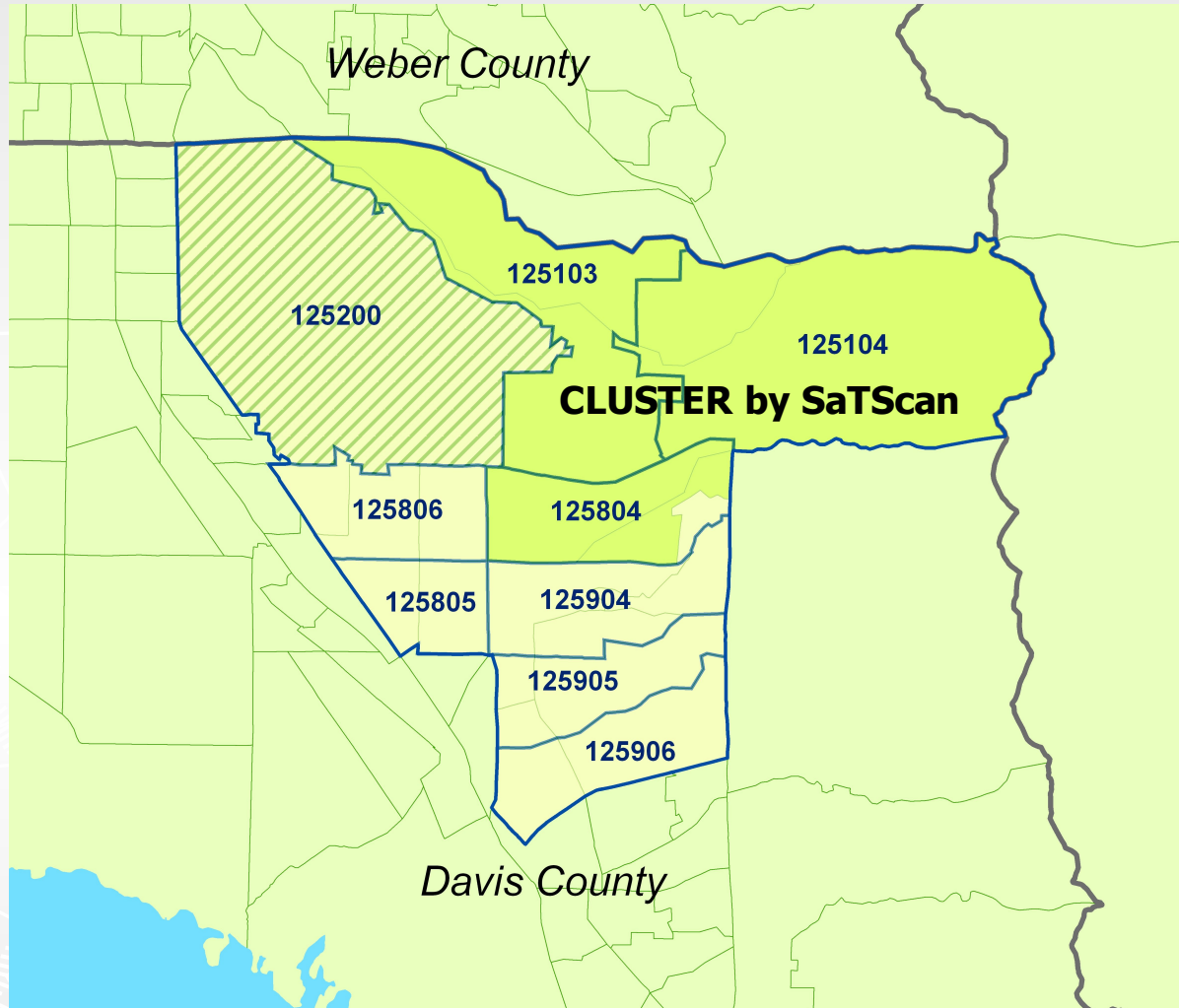


— SIR

— RIF RR

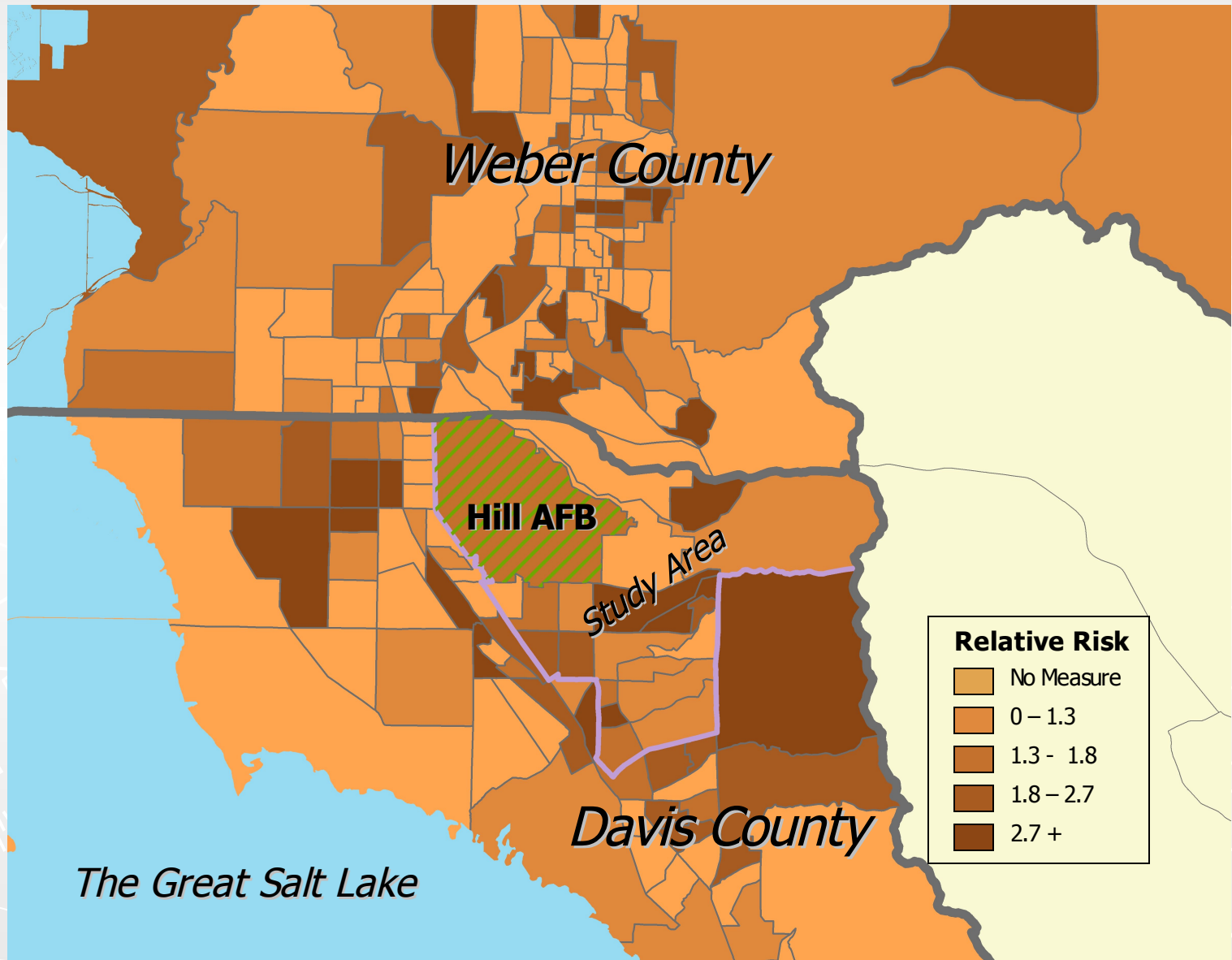
— RIF RR w SDI

# Brain

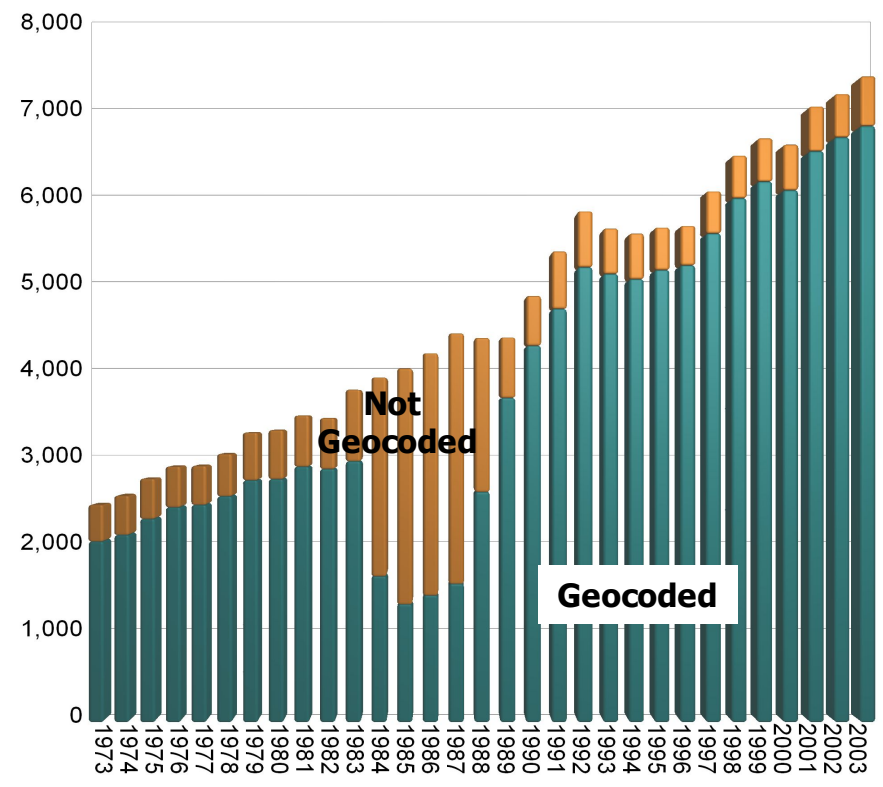
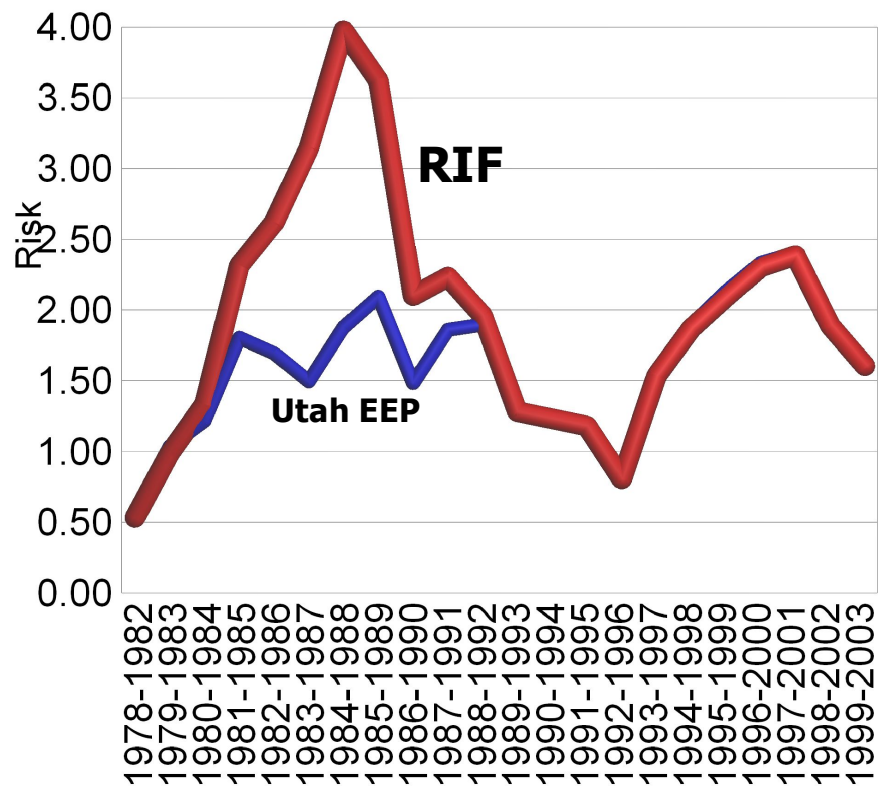


Cluster Period	1988 – 1999
Number of Cases in Cluster	21
Standardized Incidence Ratio	3.9
p-Value	0.012

# Brain









# Conclusions

- ▶ Differences in case selection methods
- ▶ RIF Relative Risk generally slightly more conservative than SIR method
- ▶ RIF allows the flexibility to follow leads derived from analysis

# Time Advantage

	TRADITIONAL METHOD	RAPID INQUIRY FACILITY
<b><i>Population Data</i></b>		3 weeks
<b><i>Cancer Data</i></b>		6 months
<b><i>Exposure Data</i></b>		2 days

## Hill AFB TCE Study

	TRADITIONAL METHOD	RAPID INQUIRY FACILITY
<b><i>Linkage</i></b>	1 week	AUTOMATIC
<b><i>Analysis</i></b>	3 days	3 hours
<b><i>Presentation and Report Generation</i></b>	1 week	AUTOMATIC

## Layton Study

	TRADITIONAL METHOD	RAPID INQUIRY FACILITY
<b><i>Linkage</i></b>	1 week	AUTOMATIC
<b><i>Analysis</i></b>	3 months	1 hour
<b><i>Presentation and Report Generation</i></b>	1 month	AUTOMATIC



Your Turn

